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Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2015/005

STATUS OF CUSK (*BROSME BROSME*) IN NAFO DIVISIONS 4VWX5Z UNDER THE PRECAUTIONARY APPROACH FRAMEWORK

Context

Cusk, *Brosme brosme*, is caught as bycatch in certain directed fisheries. Most landings are in the groundfish longline fisheries. Commercial catch rates for Cusk have declined since the 1980s. Changes to management measures (e.g., reductions to trip limits, overall caps, and bycatch percentages) may have contributed to this reduction in catch rates (and landings); however, it is thought the decline in catch per unit effort (CPUE) is also due to a decline in Cusk abundance (Harris and Hanke 2010). The extent of the decline in abundance is not known.

In 2003, Cusk was assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In response to the 2003 assessment, the Governor in Council decided in 2013 not to add Cusk to the List of Wildlife Species at Risk set out in Schedule 1 of the *Species at Risk Act* (SARA). In November 2012, however, Cusk was reassessed as Endangered by COSEWIC and is subsequently under re-consideration for listing pursuant to SARA despite the 2013 Governor in Council decision not to list.

Presently there is no dedicated survey to monitor Cusk abundance; however, the Industry-DFO Halibut Longline Survey (Halibut Survey) catch rate (kilograms per 1000 hooks) has been accepted as an index. A methodology for identifying reference points (Harris et al. 2012)., based on the 2009 DFO policy document "A fishery decision-making framework incorporating the Precautionary Approach" (PA Framework), was adopted in 2012 The average of the commercial longline CPUE from the period of higher catch rates (1986-1992) in the commercial fishery was used as a proxy for biomass at Maximum Sustainable Yield. The Upper Stock Reference (USR) and Limit Reference Point (LRP) for Cusk were set at a CPUE of 26.6 kg/1000 hooks and 13.3 kg/1000 hooks, respectively, in the Halibut Survey. The 3-year geometric mean was accepted as the metric for monitoring Cusk status relative to the USR and LRP. The stock's status in relation to the reference points was subsequently reviewed in December 2013 as a stock status update for Cusk in NAFO Divisions 4VWX5Z (DFO 2014a).

The question posed to Science by DFO's Resource Management Sector is "What is the three-year geometric mean of the Cusk CPUE from the Halibut Survey relative to the USR (26.6 kg/1000 hooks) and the LRP (13.3 kg/1000 hooks)?". The information will be used by DFO Resource Management as guidance for discussions with various industry stakeholders on recommendations for management measures. In particular, the Science Response will be provided to industry at the Scotia-Fundy Groundfish Advisory Committee meeting during discussions on implementing the PA Framework.

The 3-year geometric mean (2012-2014) of the Cusk CPUE is 13.3 kg/1000 hooks, the lowest point since 2009, which suggests that the stock is at the LRP (Figure 1).

This Science Response Report results from the Science Response Process of December 12, 2014, on the 4VWX5 Cusk Stock Status Update.

Background

It is generally accepted that the abundance of Cusk has declined since the 1980s (Harris and Hanke 2010). There are no surveys dedicated to sampling Cusk. The indices from the DFO Maritimes Region Research Vessel Summer Survey are not thought to be proportional to Cusk total population abundance because it does not sample the preferred habitat or depths of Cusk (DFO 2008). The Halibut Survey, a longline survey that samples an area from the Grand Banks of Newfoundland, along the Scotian Shelf to Georges Bank, is considered to provide a useful index of trends in Cusk abundance in NAFO Divisions 4VWX5 since 1999. It does not provide any information from before the decline of Cusk in the early 1990s therefore it cannot be used to calculate a reference point against which this trend can be compared to determine stock status.

Longline gear is an effective sampling tool for Cusk as demonstrated by the commercial fishery; over 90% of landings were made by the longline fleets (Harris and Hanke 2010).The Halibut Survey generally runs annually from May 22nd to June 22nd, although it was delayed by a month in 2007 and 2012. Variations in the Halibut Survey fishing protocol, including a shift to the use of larger hook size, large geographic area that each 'station' encompasses, lack of consistency in stations sampled, and variation in soak time and bait type, are not accounted for in the Cusk biomass index and would contribute to the high variability and could bias estimates. Further, Atlantic Halibut catch rates in the Halibut Survey have increased since 2006 (DFO 2014a), which could result in a decrease in catches of other species, including Cusk, due to greater competition for the hook. An initial analysis of number of hooks occupied revealed that, on average, about 10% of hooks have catch. The data do not indicate which hooks still had bait therefore bait loss could not be taken into account.

Description of the Fishery

The most recent Cusk landings estimate for a full fishing year season is from 2013/14. The Cusk landings for all gear types (though over 90% was from longline fishing) in 4VsWX5YZ for the 2013/14 fishing season reported in the DFO Maritimes Region was approximately 373 metric tonnes. Landings reported in other regions are low. Cusk fishing activity is currently managed by means of bycatch caps and trip limits. Cusk Harvest Control Rules are under development. Cusk caught in invertebrate fisheries, such as the lobster fishery, cannot be landed.

Table 1. Cusk Landings in metric tonnes from 2008 to 2013, the most recent complete fishing season is 2013/14. Landings are reported by fishing season (April to March), for all gear types, in NAFO areas 4VsW and 4X5YZ.

	4VsW	4X5YZ	Total
2008/2009	47	513	563
2009/2010	38	506	546
2010/2011	29	410	443
2011/2012	33	410	447
2012/2013	38	419	462
2013/2014	38	327	373

Analysis and Response

The Halibut Survey began in 1998 however the index for Cusk is from 1999 onward. Though it is a fixed station design, not all stations are sampled in all years. The 57 fixed stations used to calculate the USR and LRP (Harris et al. 2012), that is, those stations that had been sampled in all years, were included in this analysis. Note that data from 1998 were excluded in the calculation of the USR and LRP and in subsequent status updates because only 40 of the 57 stations were sampled in that year. In 2014 data

from Station 159 was excluded due to serious damage to the gear which resulted in a non-typical catch. The long-term mean for station 159 is 13.2kg/1000 hooks.

The subset of stations includes some of Cusk's preferred habitat such as the deeper areas along the shelf edge, although only a few of these 57 stations are in the Gulf of Maine, the area of highest commercial landings. The catches per set, the highest of which is 600 kg, were used to calculate standard CPUE in kilograms per 1000 hooks. When the number of hooks fished was not recorded, it was assumed that the survey standard of 1000 hooks was fished in the single set. Changes to the database in 2014 included the elimination of replicate sampling created when a station was fished by two or more boats or several times by the same boat in the same year. To avoid overweighting these stations, replicates were eliminated and the first set to fish a station with the protocol of 1000 hooks was retained as the fixed station survey set. In some cases, stations were fished by 2 or 3 sets of fewer hooks that sum to roughly 1000 hooks. In these cases, all of these sets were retained and the average CPUE for that station calculated.

The USR and LRP for Cusk in NAFO Divisions 4VWX5 are a CPUE of 26.6 kg/1000 hooks and 13.3 kg/1000 hooks, respectively, in the Halibut Survey (Harris et al. 2012). As a result of the recent changes to the database, the USR and LRP were recalculated using the same methodology as in Harris et al. (2012) to confirm their validity. The changes to the data were minor enough that the results were the same as when calculated in 2012. The recent trend in the Halibut Survey (3-year running geometric mean) was used to determine the status of the Cusk biomass in relation to the reference points. An average over several years was accepted for ongoing monitoring of stock status due to variability in the survey data. The geometric mean was recommended in preference to the arithmetic mean because it dampens the impact of occasional very high sample points on the average, providing slightly enhanced stability. The mean CPUE from the Halibut Survey has been at or above the proposed LRP for the previous 7 years (Figure 1). A high level of uncertainty is indicated by the wide confidence interval.

Indicator of Stock Status

The 3-year geometric mean (2012-2014) of the Cusk CPUE is 13.3 kg/1000 hooks, the lowest since 2009, which suggests that the stock is at the LRP (Figure 1). The 2015 average CPUE will need to be at or above 14 kg/1000 hooks in order for the 3-year geometric mean to remain in the cautious zone.

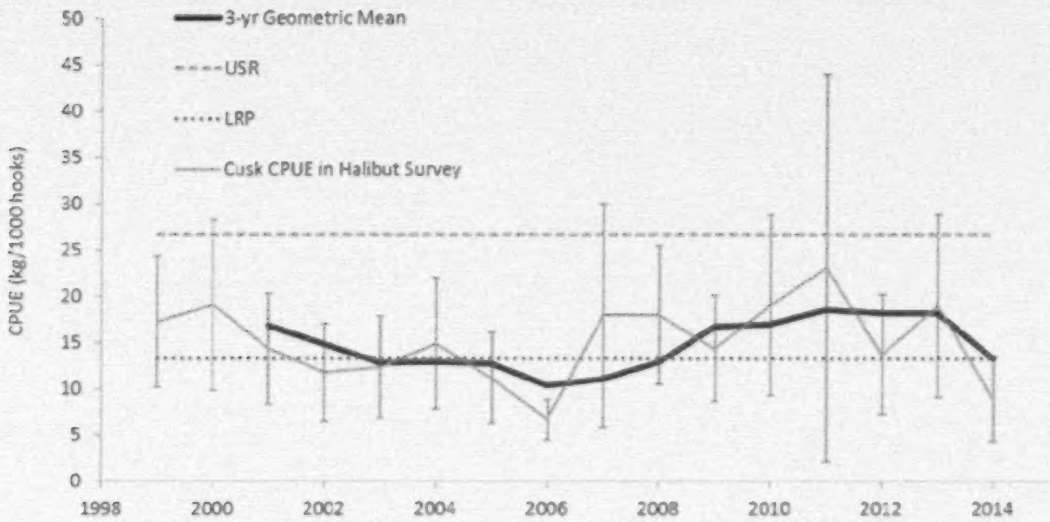

Figure 1. The green dashed reference line represents the upper stock reference point, USR (80% of proxy for biomass at Maximum Sustainable Yield), the red dotted reference line represents the limit reference point, LRP (40% of proxy for biomass at Maximum Sustainable Yield), the solid grey line represents the Cusk Catch Per Unit Effort, CPUE (kg/1000 hooks), in the Halibut Survey for stations sampled in all years (n=57), including the 95% confidence interval, and the heavy black line represents the three-year geometric mean of the Cusk CPUE. Only 56 stations were included in the analysis in 2014 due to gear damage at one station.

Conclusions

The 3-year geometric mean (2012-2014) of the Cusk CPUE is 13.3 kg/1000 hooks, the lowest point since 2009, which suggests that the stock is at the Limit Reference Point (Figure 1). If the 2015 average CPUE is below 14.0 kg/1000 hooks, the 3-year geometric mean will indicate that the stock has moved into the critical zone.

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Sources of Information

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